considered as an intermediate form between *Agnostus* and *Paradoxides* (resembling the former in its segments, the latter in its head), but then its geological position is above, not below, those genera.

In the Primordial fauna no single Trilobite has been discovered which can be regarded as an intermediate connecting link between and two other genera.

Finally, no trace of a Tribolite has been found in the antecedent Cambrian formation, and yet from the number of these fossils found it is eminently likely that had they existed they would have left traces of their existence amongst the Cambrian fossils.

The author concludes that we have here a very important discord between Darwinism and facts.

NOTES

By the kindness of Dr. Draper, of New York, we are enabled to issue to our readers this week a copy, absolutely untouched, of a photograph of a part of the solar spectrum recently obtained by that gentleman by means of the reflection grating suggested by himself, and made by Mr. Rutherfurd. There is no doubt that in all such physical inquiries as those in which Dr. Draper is interested all observations will in time be permanently recorded by means of photography, and to this end the labours of Drs. Draper, father and son, will have contributed in no mean degree.

We learn from the *Athenæum* that the Gold Medal of the Royal Astronomical Society has been awarded by the Council of the Society to Prof. Simon Newcomb, of the United States, for his tables of Neptune and Uranus, and other mathematical works.

The French Academy of Sciences, at their meeting on Monday last, elected Dr. Huggins, F.R.S., and Prof. Simon Newcomb, to fill two vacancies among the correspondents in the Astronomical Section.

We regret to announce the premature death of two eminent French *savants*, Dr. Legros, who has been poisoned in the course of histological researches, and M. Fernand Papillon, well known for his physiological investigations.

Sir Samuel Baker has been appointed Rede Lecturer in the University of Cambridge for the ensuing year. Sir Samuel, upon whom the University conferred the honorary degree of Master of Arts in 1866, will deliver the lecture in the Easter Term.

Sir Samuel Baker was entertained on Monday at a banquet given by the Mayor and Town Council of Brighton, at the Royal Pavilion. In a long and interesting speech Sir Samuel Baker referred to the progress of African discovery, the resources of Africa and the future of the natives, which he does not think hopeful, and of what he did for the suppression of the slave-trade.

There has been a good deal said recently as to the fate of the Memorial to Government in favour of an Arctic Expedition; but we believe the matter stands exactly as it did when our article appeared on Dec. 11 last (Nature, vol. ix. p. 97). The uncalled-for and aggravating delay of Mr. Gladstone in answering the Memorial is only what might be expected.

From the 1st inst. there will be published daily at Copenhagen a "Bulletin Météorologique du Nord," containing the daily reports from the Danish, Norwegian, and Swedish stations. This makes the fourth such publication in Europe, the others being published in France, Russia, and in this country. In almost all other countries the reports appear at least in the newspapers.

Ornithologists will be glad to hear of the safe arrival lately in the Gardens of the Zoological Society, of a pair of very interesting new species of White Stork (*Ciconia boyciana*) from Japan, described by Mr. R. Swinhoe nearly a year ago. This new form presents points of particular interest, as in general appearance it resembles both the common European Stork (*C. alba*) as well as the Maguari Stork (*C. maguari*) of South America, and so tends to favour the impression derived from other facts—such as the geographical distribution of the *Tapiridæ*, of the *Cinclidæ*, and perhaps of the *Cervulidæ*, if, as shown by Sir Victor Brooke, *Cervus pudu* is related to them in important osteological peculiarities—that it is in that direction, and not across the Atlantic Ocean that the European continent was last in communication with the New World.

We direct the attention of our readers to the account, given in another page, of an extraordinary gigantic new form of Miocene mammals, the *Brontotheridæ*, from Colorado, discovered by Prof. Marsh of Yale College.

We are glad to observe that Mr. Dresser's excellent work on "The Birds of Europe" continues to appear with marvellous regularity, considering the amount of work involved. A double number, comprising Parts 23 and 24, is just issued, completing the second volume in fourteen months; and the author states that he has such a large amount of manuscript ready in advance, that he can with confidence promise equal punctuality with the next volume. The work continues to maintain its high character both in letter-press and illustrations. The plates representing the Spoonbill and the Snowy Owl, in the parts just issued, are charming pictures as well as accurate ornithological portraits.

A telegram from Philadelphia announces that the Siamese Twins died on Saturday at their home in North Carolina, aged 63. Eng lived two hours longer than Chang.

We learn that M. J. C. Houzeau has been investigating the directions of the major axes of cometary orbits. He has examined 233 orbits from Mädler's catalogue, but for the purposes of his investigation he has eliminated those comets of short period, having their aphelia inside the orbit of Neptune, numbering 15, and also the seven probable appearances of Halley's comet and three others whose elements are uncertain, and so reduces the number 233 to 208; he, however, adds Comet I., 1819, making 209 comets whose orbits he discusses. He finds that there is a decided tendency in the major axes of those orbits to place themselves parallel to the double heliocentric meridian 102° 20′ and 282° 20′, being only 28° from long. 254° 5′, in which the point that the solar system is approaching is situate. The major axes do not, however, show a tendency to aggregate near lat. + 57° 26′, in which the before-mentioned point lies; but he observes that it is probable that a large number of southern comets have passed unseen, and that there may be inaccuracies in the elements of the orbits.

We have received several documents relating to the School of Mines, Ballaarat, which was established in 1870, its primary object being to impart instruction in the various branches of science relating to mining, the theory and practice of mining, mine management, mining surveying, and mining engineering. It grants certificates to all classes of men connected with mining, from mining-engineers and assayers to engine-drivers, all candidates being subjected to a good testing examination. The attendance at the School has increased every quarter since it was started, the number of students in the third term of 1873 having been 59. The benefit likely to accrue to a mining country such as Victoria from an efficient school of this kind is incalculable, and those interested in the welfare of the colony are bound to do all in their power to bring it into thorough working order, and enable it to become a national institution. The school is possessed of a good metallurgical laboratory, but its efficiency is sadly hampered for want of funds, the fees payable by the comparatively small number of students being quite insufficient to maintain the requisite staff of teachers. Government grants only 500*l.* a year, private subscription and fees amounting to about another 200*l.*, but to keep up a full staff of lectures, the Council require an income of at least double what is now at their command. This is surely a case in which the industrial welfare of the whole colony is involved, and we therefore think it is certainly the duty of the Government to see that the Ballaarat School of Mines does not fall short of complete efficiency for want of funds.

AMONG Mr. Murray's announcements of new works we notice the following, which may be of interest to our readers:—"A Memoir of Sir Roderick Impey Murchison," based upon his journals and letters, with notices of his scientific contemporaries, and a sketch of the rise and progress, for half a century, of palæozoic geology in Britain, by Professor Archibald Geikie, LL.D., F.R.S. This book will be published, we understand, early in the spring. "The Moon, considered as a Planet, a World, and a Satellite," by James Nasmyth, C.E., and James Carpenter, F.R.A.S. This work will be accompanied by numerous illustrations produced from drawings made with the aid of powerful telescopes, woodcuts, &c. "The Impending Famine in Bengal: how it will be met, and how to prevent future famines in India," by Sir Bartle Frere, D.C.L., with maps, &c. "England and Russia in the East," a series of papers on the political and geographical condition of Central Asia, by Major-General Sir Henry Rawlinson, F.R.S., with a map. A new edition of "Metallurgy," by Dr. John Percy, F.R.S., Lecturer on Metallurgy at the Government School of Mines, vol. i. containing Fuel, Wood, Coal, Copper, Zinc, &c. A new edition, re-constructed and re-written, of the first volume of Prof. Phillips' "Geology of Yorkshire," comprising the coast of the county. It will contain a large number of additional illustrations and be issued in quarto size.

ANOTHER work on the threatened famine in Bengal is announced by Messrs. Trübner & Co. It is by Dr. W. W. Hunter, Director-General of Statistics to the Government of India, and will be entitled "Famine Aspects of Bengal Districts."

DR. SCHWEINFURTH's account of his travels and discoveries in Central Africa during the years 1868 to 1871 will be published by Messrs. Sampson Low & Co. in the course of a few days. This work will be translated by Ellen E. Newer, and will contain an introduction by Winwood Reade, whose work on Africa was reviewed in NATURE a few months back. It will be copiously illustrated by woodcuts from drawings made by the author, and will be issued in two octavo volumes.

IT is known that the Russian Government have made considerable preparations in view of the great astronomical event of this year. A General Assembly of the Commission charged to study the question has finally adopted twenty-seven stations, the list of which (with latitude and longitude, the instruments available at each, and the chances of good weather) may be found in the *Revue Scientifique* for 10th inst. The probable temperatures of the different stations, at the time of observation, are also estimated; they range from — 20° C. at Kiakhta, and
° at Omsk. to + 10° at Naktritchevan and Erivan. At
chinsk and some other stations in Eastern Siberia, for which
tions are not had, the cold is expected to be still greater.
ervers for the different stations have all been appointed,
been engaged in practising with their instruments at the
y of Pulkowa. All the telescopes are mounted equatorially; and the equatorials are fitted with a clock-work movement and a micrometric apparatus. The personal equations of the different observers will be determined by means of an apparatus like that of M. Wolf (Paris Observatory), in which an artificial star is observed in its passage across a net-work of wire. The telegraphic determination of the longitudes of the various towns of Siberia is likely to be completed in 1875. Several of the stations chosen for this determination are also stations for the transit observations. The other transit stations will be easily connected with these by chronometric observations, and as for the stations bordering on the Caspian Sea and the Black Sea, these longitudes are already known with sufficient exactness.

PROFESSOR WHITTLESLEY has given a paper on the fluctuation of the level of Lake Superior—a subject specially studied by him many years ago, and which has as yet received but slight elucidation. In his present communication he has confined himself to the consideration of those fluctuations which are not only transient, but also occurring with the regularity of a wave—those low pendulum-like pulsations which are probably common to all the lakes, but are most noticeable in Lake Superior. Until a better theory can be found, he adopts the explanation that these undulations are caused by atmospheric movements.

THE Tower Hill Microscopical Club holds its first *Conversazione* at 3, Great Tower Street, on Tuesday, the 27th inst.

IN a letter to the *American Journal of Science and Arts*, dated Cordoba, September 18, 1873, Dr. Gould gives an account of a remarkable swarm of large grasshoppers, or locusts, recently witnessed there. Myriads filled the air, invaded the houses, and covered the ground, from which they rose like thick clouds of dust, on approach of man or beast. These, however, seem to have been merely the stragglers of the main body. Going out to observe the phenomenon more closely, Dr. Gould saw, to the eastward, what looked like a long trail of dense black smoke, extending over 160° of the horizon, and to an altitude of about 5°. A strong field-glass showed that it was no smoke, but a swarm of locusts. Its width there was no means of determining, but from the position of the focus needed for resolving the cloud at its point of nearest approach, Dr. Gould estimated that none of the swarm passed within less than three or four miles. The insects were evidently transported with the wind, which blew from the north with a velocity of ten miles an hour. This was at 10 A.M. (on August 13). The head of the column had passed far out of sight, and certainly twenty miles of its length were visible over the far-stretching pampa. They continued to pass in apparently undiminished numbers till daylight failed. On September 1 the phenomena were repeated, the insects being borne back by a south wind; and they were coming directly on the town when the wind hauled to S.E. and carried them past about six miles off. From measurements made, Dr. Gould stated that the height of the dense nucleus must have been at least 2,000 ft., its width here not more than six or seven miles; the whole environed by a penumbra of stragglers. At the time of writing, the wind had brought them on in full force "literally darkening the sun," and "there is probably not a square inch of our grounds unoccupied by them."

"CRONACO DEL VESUVIO," by Prof. Palmieri (Naples: Detken and Rochall, 1874), contains a brief summary of the principal eruptions from 1840 to 1872, by far the greater part of the work, however, being occupied with details of the outbreak on April 26, 1872, Palmieri's account of which has been already noticed in these pages. The present work contains several appendices on subjects of chemical and mineralogical interest in connection with eruptions of Vesuvius.

WE learn from the *Medical Record* that the Geographical

Society of Italy has received from Alexandria, with the news of the death of the explorer Miani, and various ethnological objects, two living individuals whom he had forwarded of the tribes of the Akka or Tikku-Tikki, and whom the learned traveller had bought of the King Munza. These individuals—of whom one is eighteen years old, and forty inches in height, and the other sixteen and thirty-one inches high—are stated by Miani to belong to the race of dwarfs described by Herodotus, and recently re-discovered by the German explorer Schweinfurth, who described them carefully. They are pot-bellied, very thin-limbed, and knock-kneed, spherical and prognathous crania, very long limbs, copper skins, and crisp, tow-like hair.

"EXTRA No. 14" (Scientific Series) of the *New York Tribune* is devoted to accounts of three scientific expeditions. The first the Hayden Expedition of 1873, an account of which is given in a letter from Prof. W. D. Whitney, and in a review by Dr. F. V. Hayden; of the progress of this expedition we have at various times given news. A "New Route to Yellowstone Park" is described in the account of Captain Jones's Expedition of 1873. The third expedition is that of the late Professor Agassiz to Brazil, the *Tribune* reproducing the six lectures delivered by Agassiz after his return in February 1867.

WE have received in a separate form two papers communicated to the French Academy by M. A. Poëy—one on the "Connection between Solar Spots and the Hurricanes of the Antilles, of the North Atlantic and the Southern Indian Ocean," and the other on the "Connection between the Solar Spots, the Storms at Paris and Fécamp, the Tempests and Sudden Storms in the North Atlantic."

WE have received from Quebec the "Transactions of the Literary and Historical Society" of that city, for session 1872-3, the longest paper in which is an interesting diary of "A Whaling Voyage to Spitzbergen in 1818," kept by Dr. James Douglas. Another paper, by Dr. H. H. Mills, contains some observations on Canadian Chorography and Topography, and on the meritorious services of Jean Baptiste Duberger, sen., who died in 1821, and who seems to have been an excellent surveyor and map-maker. The Society appears to have been in existence for many years, is in a flourishing condition as to members and income, and possesses a good Natural History Museum. We are glad to see that the Society's programme includes scientific as well as literary and historical subjects.

THE *Bulletin* of the French Geographical Society, for December, contains an account of a voyage made last autumn by M. A. Pinart along the south coast of the Aleutian Isles and the Peninsula of Alaska, illustrated by a good map; the continuation of M. J. Halévy's Journey to Nedjràn; and a very long paper by M. Dournaux-Dupéré, on the part which France ought to play in Northern Africa, advocating the complete subjection of the Sahara by France.

"ON the Geology of Western Wyoming," is a paper by Mr. T. B. Comstock, reprinted from the *American Journal of Science and Arts*.

THE additions to the Zoological Society's Gardens during the past week include two Cinereous Sea Eagles (*Haliaëtus albicilla*), European, presented by Sir Victor Brooke, Bart.; a pair of Pink-headed Ducks (*Anas caryophyllacea*) from India, new to the collection; a Nicobar Pigeon (*Calœnas nicobarica*), from the Indian Archipelago; a Cheetah (*Felis jubata*) from Africa; a White-lipped Peccary (*Dicotyles labiatus*), from South America; a Sooty Mangabey (*Cercocebus fuliginosus*), from West Africa; a Verreux's Guinea fowl (*Numida cristata*), from East Africa; a Masked Weaver Bird (*Hyphantornis personata*), from West Africa; and four Grenadier Weaver Birds (*Euplectes oryx*), from Abyssinia, purchased, or received in exchange.

NEW REMARKS ON THE NATURE OF THE CHEMICAL ELEMENTS, BY M. BERTHELOT[*]

THERE will be no necessity for me to remind the Academy of the great importance of the question raised at the last meeting. Between our illustrious master, M. Dumas, and the author of these lines, there should not be any difference of opinion neither on the principles of a science which he himself has taught us, nor as to the originality of his ideas with regard to the chemical elements, their relation to each other or to the organic radicles.

It is therefore more for the purpose of avoiding the reproach of an incomplete knowledge of the science than for further insisting on what I have before advanced, that I ask his permission to quote in this place, p. 280 of his "Leçons de Philosophie Chimique" a passage in which he has approached my own remarks:—

"Before commencing with any confidence to build a system upon this foundation," says M. Dumas, "it is necessary that a great number of exact experiments should increase our knowledge of it. It will therefore be of the greatest importance to study compounds in relation to their capacities for heat, for it cannot be supposed that the relation of the specific heat to the weight of the atom holds only for elementary bodies; it is also found in compounds of the same order. It would therefore be wrong to seek in this direction for a proof of the truth of the ideas which we have imagined of the bodies which appear to us to be elements, and we ought to say that the capacity of their chemical atoms tends towards equality because they are bodies of the same order, without their elementary nature necessarily following from it."

In support of these opinions M. Dumas cites the then recent experiments of Naumann on the specific heats of the carbonates of barium, strontium, calcium, iron, zinc, and magnesium, which, multiplied by their corresponding atomic weights, give a constant product of 131; while the sulphates of barium, strontium, calcium, and lead give the product 155. M. Dumas adds with reason—"For the other compounds we are in want of data sufficiently precise to enable us to make similar comparisons."

It will be seen then that in 1836 the point in question is no longer the relation between the specific heats of compounds and that of their elements, but entirely between compounds of the same order, *à fortiori* the possibility of distinguishing elements from compound bodies in general by means of specific heats was expressly discarded.

Although the specific heats of compound bodies were formerly but little known, the gap was being filled for many series by the researches of M. Regnault. But Regnault, like Naumann, confined himself to the determination of the specific heats of compounds the constitution of which was similar, without seeking to establish any more remote relation.

Wœstyn in 1848 was, I believe, the first to announce the approximate relation between the specific atomic heat of a compound and those of its elements, and the partial relations discovered by Naumann and Regnault then became a consequence of this more general law.

In applying it in my turn to the organic radicles and especially to the carbides of hydrogen, I have been led to put in evidence the difference which distinguishes their specific heats from those of the elements, whether taken individually or together, as members of a group of bodies of the same order. The carbides of the ethylene series are bodies of the same order, and present quite as many analogies amongst themselves as simple radicles such as calcium, barium, strontium, iron, zinc, and magnesium do, and the same may be said of the combination formed by these radicles. I repeat, therefore, that as the specific atomic heats of the simple radicles have the same value, and this value being known and considered in connection with their atomic weights, the simplicity of their composition results of necessity therefrom almost always, as I have already established in my preceding note. At the same time the specific atomic heats of the com-

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[*] Translated from the *Comptes Rendus* of December 15, 1873. At the preceding meeting M. Berthelot read a note on the same subject, in which he gave a more detailed description of the observed differences between the specific atomic heats of elements and compounds. The principal points were, that whilst the specific atomic heats of elements whose atomic weights are multiples of the same number, such as the S, Se, Te group, are identical, the specific atomic heats of compounds whose atomic weights are multiples of some common number, as in the group of polymerised hydrocarbons, ethylene, amylene, caprylene, &c., are multiples of each other, being proportional to their atomic weights. He concludes: "This difference is important, inasmuch as the notion of specific heat is a representation of the general molecular work by which bodies are maintained in an equilibrium of temperature with each other and it would also indicate that the decomposition of our elements, if possible, ought to be accompanied by phenomena of another kind than those which determine the decomposition of our compounds."